

TITLE

**VIDEO DISPLAY APPARATUS WITH ON-SCREEN DISPLAY PIVOTING
FUNCTION**

BACKGROUND OF THE INVENTION

Technical Field

The present invention relates to a video display apparatus with an on-screen display pivoting function. More specifically, the present invention relates to a video display apparatus with an on-screen display pivoting function in which, even when the user arbitrarily pivots the monitor of a computer system, the on-screen display is normally displayed.

Related Art

Generally, a video display apparatus such as the monitor of a computer system has functions such that the user can arbitrarily adjust the brightness and size of the picture. In addition, such a video display apparatus typically has an on-screen display (OSD) capability.

Monitors associated with computer systems also have the capability of being rotated by 90 degrees about an axis passing from the front of the monitor to the rear thereof. However, when such rotation is carried out, the OSD on the screen of the monitor also rotates through 90 degrees so that the letters and figures of the OSD appear to be lying on their sides relative to their previous, unrotated appearance.

Thus, as a result of such rotation of the monitor, the user thereof is substantially

1 inconvenienced in that it is difficult for the user to see or accurately view the OSD.

2 SUMMARY OF THE INVENTION

3 The present invention is intended to overcome the above described disadvantage.

4 Therefore, it is an object of the present invention to provide a video display apparatus with
5 an on-screen display pivoting function in which, even when a video display apparatus such as a
6 monitor of a computer system is arbitrarily turned, the on-screen display can be displayed in a
7 normal manner.

8 In achieving the above object, the video display apparatus with an on-screen display pivoting
9 function according to the present invention includes: an OSD (on-screen display) generating section
10 for receiving horizontal/vertical synchronizing signals and clock signals from an external source,
11 and for outputting first video signals in response to OSD control signals from an outside source; a
12 pivot circuit section for receiving the first video signals, for storing in a position-converting manner
13 a write address of the first video signals in correspondence with a pre-set pivot write address, and
14 for converting the write address in response to the horizontal/vertical synchronizing signals and the
15 clock signals so as to output the first video signals in the form of second video signals; a scale
16 converting section for furnishing the horizontal/vertical synchronizing signals and the clock signals
17 to the OSD generating section and the pivot circuit section, respectively, and for receiving the
18 second video signals so as to convert scales of the second video signals in response to scale control
19 signals from an outside source; and a control section for furnishing OSD control signals and scale
20 control signals to the OSD generating section and to the scale converting section, respectively, in

1 response to OSD driving signals (generated by a user), and for furnishing pivot control signals to the
2 pivot control section in response to mode control signals (also generated by the user).

3 In another aspect of the present invention, the video display apparatus with an on-screen
4 display pivoting function according to the present invention includes: a power supply section for
5 supplying power; a display section for receiving the power from the power supply section, and for
6 displaying a picture corresponding to video signals externally inputted by a user; a signal
7 converting/clock generating section for receiving horizontal /vertical synchronizing signals and video
8 signals, for converting the video signals to digital signals in response to first control signals (from
9 an outside source), and for outputting clock signals; a decoder for receiving brightness/chromatic
10 signals from an outside source so as to convert the brightness/chromatic signals to digital signals in
11 response to second control signals (from an outside source); a frame rate converting section for
12 receiving the horizontal /vertical synchronizing signals and the video signals from the signal
13 converting/clock generating section, for receiving the brightness/chromatic signals from the decoder,
14 for storing the video signals in response to third control signals (from an outside source), and for
15 converting the video signals (thus stored) to a certain frequency ratio corresponding to display
16 characteristics of a display section; an OSD (on-screen display) generating section for receiving
17 horizontal /vertical synchronizing signals and clock signals from an outside source, and for
18 outputting first video signals in response to OSD control signals from an outside source; a pivot
19 circuit section for receiving the first video signals, for storing in a position-converting manner a write
20 address of the first video signals corresponding to a pre-set pivot write address, and for converting
21 the write address in response to the horizontal /vertical synchronizing signals and the clock signals

so as to output the first video signals in the form of second video signals; a scale converting section for furnishing the horizontal/vertical synchronizing signals and the clock signals to the OSD generating section and the pivot circuit section, respectively, for converting scales of video signals of the frame rate converting section, and for receiving the second video signals so as to convert scales of the second video signals of the pivot circuit section in response to scale control signals from an outside source; a control section for furnishing the first, second and third control signals to the signal converting /clock generating section, the decoder and the frame rate converting section, respectively, for furnishing OSD control signals and scale control signals to the OSD generating section and to the scale converting section, respectively, in response to OSD driving signals (generated by a user), and for furnishing pivot control signals to the pivot control section in response to mode control signals (generated by the user); and a driving section for furnishing the video signals and driving signals from the scale converting section to the display section.

In this video display apparatus with an on-screen display pivoting function, even if the screen body is turned by 90 degrees, the letters and figures of the on-screen display are displayed in the normal manner. Therefore, the user can use the on-screen display in a convenient way.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention, and may of the attendant advantages, thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

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Fig. 1 illustrates an on-screen display of a video display apparatus;

Fig. 2 illustrates an abnormal display of an on-screen display when the screen body is turned by 90 degrees;

Fig. 3 is a block diagram showing a video display apparatus with an on-screen display pivoting function according to the present invention;

Fig. 4 is a block diagram showing a pivot circuit section according to the present invention;

Fig. 5 is a block diagram showing another embodiment of the pivot circuit section according to the present invention;

Figs. 6 and 7 illustrate data maps which are stored in the case where the on-screen display pivoting function of the invention is not utilized;

Figs. 8 and 9 illustrate data maps which are stored in the case where the on-screen display pivoting function of the present invention is utilized; and

Fig. 10 illustrates the on-screen display displayed in the normal manner by the video display apparatus with an on-screen display pivoting function according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 illustrates an on-screen display of a video display apparatus.

As shown in Fig. 1, the on-screen display function is carried out on a screen 13 when the user manipulates a particular key of a key pad 15 to generate an on-screen display 14, the key pad 15 being located on a screen body 11 of the video display apparatus 10.

Fig. 2 illustrates an abnormal display of an on-screen display when the screen body is turned

1 by 90 degrees. As shown in Fig. 2, if the screen body 11 of the video display apparatus 10 is turned
2 by 90 degrees, then the on-screen display 14 on screen 13 is also turned by 90 degrees. ~~Therefore~~
3 the letters and figures of the on-screen display are laid on their side as viewed by the user.
4 Accordingly, when the screen body 11 of the video display apparatus 10 is turned by 90 degrees,
5 the user encounters a substantial inconvenience.

6 Fig. 3 is a block diagram showing a video display apparatus with an on-screen display
7 pivoting function according to the present invention; Fig. 4 is a block diagram showing a pivot
8 circuit section according to the present invention; and Fig. 5 is a block diagram showing another
9 embodiment of the pivot circuit section according to the present invention.

10 Referring to Fig. 3, the video display apparatus with an on-screen display pivoting function
11 according to the present invention includes: a power supply 1000 for supplying power (9 V or 12 V);
12 a display panel 1100 for receiving power from the power supply 1000, and for displaying a picture
13 of externally inputted R-G-B video signals to a user in response to driving signals; a signal
14 converter/clock generator 100 for receiving horizontal /vertical synchronizing signals H/V SYNC
15 and R-G-B video signals, for converting the R-G-B video signals to digital signals in response to
16 first control signals (from an outside source), for generating clock signals, and for producing output
17 signals 101; a decoder 300 for receiving brightness/chromatic signals (Y/C) from an outside source
18 so as to convert the brightness/chromatic signals to digital signals 301 in response to second control
19 signals 204 (from an outside source); a frame rate converter 400 for receiving the output signals 101
20 from the signal converter/clock generator 100, for receiving the digital signals 301 from the decoder

1 300, for storing R-G-B signals in response to third control signals 206 (from an outside source), for
2 converting the R-G-B signals (thus stored) so as to have a certain frequency ratio corresponding to
3 display characteristics of a display panel 1100, and for generating an output 401; a frame memory
4 500 for storing the R-G-B signals for the signal converter /clock generator 100 under the control of
5 the frame rate converter 400; an OSD (on-screen display) generator 700 for receiving horizontal
6 /vertical synchronizing signals and clock signals 601 from an outside source, and for outputting first
7 R-G-B signals 701 in response to OSD control signals 210 from a controller 200; a pivot circuit 800
8 for receiving the first R-G-B signals 701, for storing in a position-converting manner a write address
9 of the first R-G-B signals 701 in correspondence to a pre-set pivot write address, and for converting
10 the write address in response to the horizontal /vertical synchronizing signals and the clock signals
11 so as to output second R-G-B signals 801; a scale converter 600 for furnishing the
12 horizontal/vertical synchronizing signals and the clock signals 601 to the OSD generator 700 and
13 the pivot circuit 800, respectively, for converting scales of video signals of the frame rate converter
14 400, and for receiving the second R-G-B signals to convert scales of the second R-G-B signals 801
15 of the pivot circuit 800 in response to scale control signals 208 from an outside source; a controller
16 200 for furnishing the first, second and third control signals 202, 204 and 206, respectively, to the
17 signal converting /clock generator 100, the decoder 300 and frame rate converter 400, respectively,
18 for furnishing OSD control signals 210 and scale control signals 208 to the OSD generator 700 and
19 to the scale converter 600, respectively, in response to OSD driving signals (generated by the user),
20 and for furnishing pivot control signals 212 to the pivot circuit 800 in response to mode control
21 signals (generated by the user); and a panel driver 900 for receiving the R-G-B signals 602 from the

scale converter 600 and furnishing driving signals 901 to the display panel 1100.

Referring to Fig. 4, the pivot circuit 800 includes: a B-pivot circuit 800a for receiving B-data signals OSD-B of the first R-G-B signals 701 from the OSD generator 700, for storing in a position-converting manner a write address of the B-data signals OSD-B in correspondence with a pre-set pivot write address in response to pivot control signals 212, and for converting the write address in response to the horizontal /vertical synchronizing signals and clock signals 601 so as to output the stored B-data signals OSD-B in the form of B-data signals B of the second R-G-B signals 801; a G-pivot circuit 800b for receiving G-data signals OSD-G of the first R-G-B signals 701 from the OSD generator 700, for storing in a position -converting manner a write address of the G-data signals OSD-G in correspondence with a pre-set pivot write address in response to pivot control signals 212, and for converting the write address in response to the horizontal /vertical synchronizing signals and clock signals 601 so as to output the stored G-data signals OSD-G in the form of G-data signals G of the second R-G-B signals 801; and an R-pivot circuit 800c for receiving R-data signals OSD-R of the first R-G-B signals 701 from the OSD generator 700, for storing in a position-converting manner a write address of the R-data signals OSD-R in correspondence with a pre-set pivot write address in response to pivot control signals 212, and for converting the write address in response to the horizontal /vertical synchronizing signals and clock signals 601 so as to output the stored R-data signals OSD-R in the form of R-data signals R of the second R-G-B signals 801.

Referring to Fig. 5, the B, G and R-pivot circuits 800a, 800b and 800c, respectively, have

the same composition.

The B-pivot circuit 800a includes: an analog/digital converter 810 for receiving the B-data signals of the first R-G-B signals 701 from the OSD generator 700 so as to convert them to digital signals; a buffering section 820 for receiving and storing the digital B-data signals from the analog/digital converter 810, and for outputting previous B-data signals upon receiving next B-data signals from the analog/digital converter 810; a pivot controller 840 for outputting storing position control signals 841 and data selection control signals 842 in response to pivot control signals 212 from the controller 200; a data storing section 830 for receiving and storing the B-data signals of the buffering section 820, and for storing in a position-converting manner a write address of the B-data signals of the buffering section 820 in correspondence with a pre-set pivot write address in response to store position control signals 841; and a data selector 850 for receiving the B-data signals of the first R-G-B signals 701 or the B-data signals of the data storing section 830 so as to output the B-data signals of the first R-G-B signals 701 or the B-data signals of the data storing section 830 in the form of second R-G-B signals 801.

Under this condition, the buffering section 820 of the B-pivot circuit 800a includes eight buffers 820a, 820b, 820c, 820d, 820e, 820f, 820g and 820^h for storing the 8-bit data of the analog/digital converter 810.

The compositions of the G-pivot circuit 800b and the R-pivot circuit 800c, respectively, are the same as that of the B-pivot circuit 800a. Further, the buffering sections of the G-pivot circuit 800b and the R-pivot circuit 800c, respectively, are the same as that of the B-pivot circuit 800a.

Now the operation of the video display apparatus with an on-screen display pivoting function

according to the present invention will be described.

Figs. 6 and 7 illustrate data maps which are stored in the case where the on-screen display pivoting function of the invention is not utilized. Figs. 8 and 9 illustrate data maps which are stored in the case where the on-screen display pivoting function of the invention is utilized. Fig. 10 illustrates the on-screen display displayed in the normal manner in the video display apparatus with an on-screen display pivoting function according to the present invention.

The case where the user does not turn the screen body 11 is the same as the conventional case and, therefore, the operation of this case will be omitted. The case where the user turns the screen body 11 clockwise by 90 degrees will be described.

Further, the operations of the components of the pivot circuit 800 will be described with reference to the B-pivot circuit 800a, because the operations of the G and R-pivot circuits 800b and 800c, respectively, are the same as that of the B-pivot circuit 800a.

First, referring to Fig. 3, the signal converter /clock generator 100 converts the incoming R-G-B signals to digital signals in response to the first control signals 202 of the controller 200. Further, the generator 100 generates clock signals 101 in response to the horizontal /vertical synchronizing signals so as to meet the operation criteria for the video display apparatus according to the present invention.

The decoder 300 converts the brightness/chromatic signals to digital signals 301 in response to the second control signals 204 of the controller 200.

The frame rate converter 400 writes the digital R-G-B signals of the signal converter /clock generator 100 into the frame memory 500. Then, the frame rate converter 400 sequentially reads

1 them for conversion so as to have a certain frequency ratio corresponding to the characteristics of
2 the display panel 1100.

3 Then, if the user supplies the OSD driving signal to the controller 200 by manipulating a
4 particular key of the key pad 1105 (see Fig. 10) of the display panel 1100 to use an on-screen display
5 1104, then the controller 200 supplies an OSD control signal 210 to the OSD generator 700 in
6 response to the user's OSD driving signal.

7 The OSD generator 700 supplies the first R-G-B signals 701 to the analog /digital converter
8 810 of the pivot circuit 800 in response to the OSD control signal 210.

9 Under this condition, the display panel 1100 has been turned by 90 degrees clockwise and,
10 therefore, the user has to supply a mode control signal to the controller 200 by pressing another
11 particular key of the key pad 1105 so that an on-screen display 1104 suitable for the turned status
12 of the display panel 1100 will be displayed.

13 If the user does not manipulate the particular key to generate the mode control signal, then
14 the on-screen display will be displayed with the letters and figures laid on their side as seen in Fig.
15 2.

16 Conversely, if the mode control signal is generated by the manipulation of the key by the
17 user, then the controller 200 supplies a pivot control signal 212 to the pivot circuit 800 so as to
18 display an on-screen display suitable to the turned status of the display panel 1100.

19 Then, the analog/digital circuit 810 of the B-pivot circuit 800a of the pivot circuit 800
20 sequentially receives the B data signals of the first R-G-B signals 701.

21 The first to eighth buffers 820a, ..., 820^h, respectively, of the buffering section 820 store the

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B data signals of the analog/digital circuit 810. Then, when the next B data signals are inputted, the preceding 8-bit B data signals are outputted.

That is, if the alphabet character "A" of Fig. 7 is taken as an example, the B data signals of the alphabet character "A" are supplied to the buffering section 820, starting from the first column C1 in the order of "00000000", "00111100", "00100100", "00100100", "00111100", "00100100", "00100100" and "00000000".

Under this condition, the G and R data signals of the alphabet character "A" are supplied in the same manner.

Then, the pivot controller 840 supplies the store position control signals 841 and the data selection control signals 842 to the data memory 830 and the data selector 850, respectively.

The data memory 830 then receives the B data signals of the alphabet character "A" from the first to eighth buffers 820a, ..., 820^h, respectively, of the buffering section 820 so as to store them.

However, the data memory 830 stores in a position-converting manner the storing address of the B data signals of the alphabet character "A" (which are inputted from the first to eighth buffers of the buffering section 820) in response to the storing position control signals of the pivot controller 840.

That is, the B data signals "00000000" which correspond to the first column C1, and which are first outputted from the buffering section 820, are stored in the first storing positions of the respective columns C1, C2, C3, C4, C5, C6, C7 and C8 of the alphabet character "A" of Fig. 8, that is, in the storing positions of the first row R1.

The B data signals "00111100" corresponding to the second column C2 for the alphabet

character "A" of Fig. 7, which are outputted next, are stored in the second storing positions of the respective columns C1, C2, C3, C4, C5, C6, C7 and C8 for the alphabet character "A" of Fig. 8, that is, in the second row R2.

Through this procedure, when the B data signals "00000000" corresponding to the eighth column C8 for the alphabet character "A" of Fig. 7 are stored in the eighth positions of the respective columns C1, C2, C3, C4, C5, C6, C7 and C8, that is, when they are stored in the eighth row R8, the storing of the B data signals for the alphabet character "A" is completed.

The G and R data signals of the alphabet character "A" are stored in the data memory 830 through the same procedure as that of the B data signals. Further, alphabet characters "B", "C" and "D" of Fig. 7 are also stored in data memory 830 through the same procedure.

Then, the data selector 850 receives, from the OSD generator 700, the B data signals of the first R-G-B signal 701 which have not been converted in accordance with pivoting. Further, the data selector 850 receives, from the data memory 830, the B data signals of the first R-G-B signals 701 which have been converted in accordance with pivoting.

The data selector 850 selects one set of the B data signals from among the B data signals of the converted first R-G-B signals 701 and the non-converted first R-G-B signals 701 so as to supply them, in the form of second R-G-B signals 801, to the scale converter 600.

Under this condition, the display panel 1100 has been turned, and a mode control signal has been generated by the user. Therefore, the data selection control signal 842 is supplied as a signal showing the pivot enable status.

Accordingly, the data selector 850 supplies the B data signals of the converted (converted

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1 in accordance with pivoting) first R-G-B signals 701 to the scale converter 600 as second R-G-B
2 signals 801.

3 The scale converter 600 receives the second R-G-B signals 801 from the B, G and R-pivot
4 circuits 800a, 800b and 800c of the pivot circuit 800.

5 The scale converter 600 converts the second R-G-B signals 801 in response to the scale
6 control signals 208 from the controller 200.

7 Then, if the second R-G-B signals 602 which have been scale-converted by the scale
8 converter 600 are outputted, the panel driver 900 receives the second R-G-B signals 602 of the scale
9 converter 600 and provides a driving signal 901 to the display panel 1100 so as to drive the display
10 panel 1100.

11 The display panel 1100 receive power from the power supply 1000, and receives the second
12 R-G-B signals from the panel driver 900. Further, the display panel 1100 displays the second R-G-
13 B signals on the screen in the form of an on-screen display in response to the driving signal 901 of
14 the panel driver 900.

15 In this manner, if the user has turned the display panel 1100 by 90 degrees clockwise, the
16 R-G-B signals of the on-screen display are displayed after being pivoted and, therefore, the letters
17 and figures of the on-screen display 1104 are displayed in the normal manner as seen by the user.
18 This is illustrated in Fig. 10.

19 According to the present invention as described above, even in the case where the user turns
20 the screen body by 90 degrees for the sake of convenience, the letters and figures of the on-screen

1 display are displayed in the normal manner as viewed by the user.

2 Therefore, the user can use the on-screen display in a convenient manner, regardless of the
3 turning or non-turning of the screen body. Further, even in the case where the chromatic signals and
4 synchronizing signals are synthetically inputted instead of the first and second R-G-B signals, the
5 same pivoting function is carried out.

6 In the above, the present invention was described based on the specific preferred
7 embodiment, but it should be apparent to those ordinarily skilled in the art that various changes and
8 modifications can be added without departing from the spirit and scope of the present invention,
9 which are defined in the appended claims.